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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 060109

FINAL REPORT

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

ARTIFICIAL-BREEDING TECHNICIAN II 467.364

S-70

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EDUCATION & WELFARE
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U. S. Employment Service in
Cooperation with
Wisconsin State Employment Service

U. S. DEPARTMENT OF LABOR

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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR ARTIFICIAL-BREEDING TECHNICIAN II 467.364

Summary

The General Aptitude Test Battery, B-1002A, was administered to two groups of Artificial-Breeding Technicians, which were combined into one sample of 59 people. The first group included 34 experienced male technicians employed by the Tri-State Breeders Cooperative located at Westby, Wisconsin. The second group included 25 male technicians employed by the Southern Wisconsin Breeders Cooperative, Madison, Wisconsin. The criterion used for each group consisted of rank order ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes G-Intelligence and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Artificial-Breeding Technician II 467.364

Table I shows for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Artificial-Breeding Technician 3-48.94.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-70

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	95	G	Part 3 Part 4 Part 6	90
M	CB-1-M CB-1-N	80	M	Part 9 Part 10	80

Effectiveness of Norms

The data in Table IV indicate that 10 of the 17 poor workers, or 59 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 59 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 36 of the 43 workers who made qualifying test scores, or 84 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Artificial-Breeding Technician II 467.364.

II. Sample

The GATB, B-1002A, was administered to one group of Artificial-Breeding Technicians during November 1954 and to another group during January 1955. The total experimental sample consisted of 61 male workers employed by two firms: 35 from the Tri-State Breeders Cooperative, Westby, Wisconsin and 26 from the Southern Wisconsin Breeders Cooperative, Madison, Wisconsin. All of the Technicians from Southern Wisconsin Breeders Cooperative and all of the Tri-State Breeders Cooperative Technicians who lived within a radius of 60 miles from Westby, Wisconsin were asked to volunteer for this test development project. Of the 61 workers tested, two were eliminated from the sample because they had difficulty reading the instructions since they forgot to bring their eye glasses with them. This resulted in a final sample of 59 technicians.

A high school education is preferred for applicants entering this occupation, but this provision has not been strictly adhered to in the past. The preferable starting age is 25 years. Six months of experience was considered the minimum length of time to learn this occupation. No tests are used in the hiring process. Hiring is done by means of a personal interview and check of references.

Since the job duties, performance level, and criterion data as well as the age and education characteristics of the two groups were found to be quite similar, they were combined into one sample of 59 Artificial Breeding Technicians.

Table II shows the means, standard deviations, ranges, Pearson product-moment correlations (corrected for broad categories) with the criterion and the standard errors of correlations for age, education and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$), and the Standard Errors of Correlation (σ_{cr}) for Age, Education, and Experience

Artificial-Breeding Technician II 467.364
N - 59

	M	σ	Range	$_{c}r$	σ_{cr}
Age (Years)	33.1	5.2	25-45	-.039	.130
Education (years)	11.1	1.8	8-14	-.042	.130
Experience (months)	58.2	26.3	5-127	.003	.130

The data in the above table indicate that there are no significant correlations between age, education or experience and the criterion. All but one of the workers had at least six months of experience, but he was included in the sample because he was considered to have progressed satisfactorily during his five months on the job.

III. Job Description

Job Title: Artificial-Breeding Technician II 467.364

Job Summary: Breeds dairy and beef cows by means of artificial insemination and contacts farmers to sell membership in Cooperative Breeders Association. Keeps records of members serviced, cows bred, and mileage travelled. Prepares weekly reports on activity in area.

Work Performed

Schedules travel route to conserve time by making out daily itinerary from requests called in by members. Selects required supply of prepared semen fluid from various breeds of bulls and stores in glass vials in carrying case along with other equipment. Drives to first farm on itinerary. Locates animal to be bred by checking for stanchion tag, registration certificate, or other marker placed in barn by farmer. Prepares disinfectant solution by adding small amount of liquid disinfectant to pail of water. Dresses left arm in rubber sleeve and glove. Disinfects sleeve and glove with solution. Fills small rubber bulb with 2/3 to 3/4 of 1 c.c. of semen. Attaches rubber bulb to end of sterilized plastic tube (pipette) and holds pipette in teeth to leave both hands free. Calms animal by talking in low voice and stroking its flanks. Wipes excess moisture and waste from animal with a paper towel. Inserts pipette into animal and injects semen by squeezing rubber bulb on end of pipette. Removes pipette from animal, removes semen bulb from pipette and replaces bulb and glove in carrying case for next breeding. Fills out breeding receipt, identifying animal by name or ear tag number on registered cows. Records breeding on daily itinerary

schedule. Thoroughly cleans all equipment at end of each day. Stores semen bulbs in alcohol to sterilize them for future use. Visits farmers in territory to explain cooperative and sign up new members. Calls on current members not using service to determine reasons and adjusts minor complaints. Reports difficulties he cannot adjust to district supervisor for further action. Keeps records of members serviced, cows bred, and mileage travelled. Prepares weekly reports to home office on activity in area.

IV. Experimental Battery

All of the parts of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consists of supervisory ratings made by the supervisors in charge of the workers. The ratings were based on the conception efficiency and the general ability to learn and do this work. Each rater ranked the workers under his supervision in the order of their ability and divided the workers into three categories: above average, average and below average as compared with "technicians in general." For statistical analysis these broad category ratings were combined and converted into quantitative scores. For the combined sample the above average group with 16 workers, the average group with 26 workers, and the below average group with 17 workers received scores of 62, 50 and 38, respectively.

VI. Statistical and Qualitative Analysis

Table III shows the means, standard deviations, Pearson product-moment correlations (corrected for broad categories) with the criterion and the standard errors of correlation for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) and Standard Errors of Correlation ($\sigma_{c}r$) for the Aptitudes of the GATB

Artificial-Breeding Technician II 467.364

N = 59

Aptitudes	M	σ	$_{c}r$	$\sigma_{c}r$
G-Intelligence	104.3	12.4	.396**	.110
V-Verbal Aptitude	98.3	13.9	.279*	.120
N-Numerical Aptitude	106.5	12.4	.318*	.117
S-Spatial Aptitude	100.6	15.7	.117	.128
P-Form Perception	99.1	16.7	-.009	.130
Q-Clerical Perception	104.1	13.2	.111	.129
K-Motor Coordination	102.1	15.4	.055	.130
F-Finger Dexterity	88.8	18.2	.141	.128
M-Manual Dexterity	100.5	19.5	.331*	.116

** Significant at the .01 level.
* Significant at the .05 level.

The statistical results were interpreted in conjunction with job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Intelligence - (G) - required in learning and applying the proper breeding techniques, in scheduling calls, and in maintaining accurate records.

Manual Dexterity - (M) - required in the careful use of the hands in examining the animal to be bred and in the insertion of the pipette carefully to avoid damaging the cow's internal organs.

To a lesser extent Clerical Perception is required to maintain accurate records and Numerical Aptitude to compute mileage and collections.

The highest mean scores were obtained for Aptitudes N, G, Q, and K respectively, in descending order of magnitude. All of the aptitudes have standard deviations of less than 20 with Aptitudes G and N exhibiting the smallest sigmas.

When N=59, correlations of .334 and .257 are significant at the .01 level and the .05 level, respectively. Aptitude G correlates significantly with the criterion at the .01 level of confidence. Aptitudes V, N and M correlatessignificantly with the criterion at the .05 level of confidence.

Aptitudes G, N and M were considered for inclusion in the test norms on the basis of the qualitative and quantitative factors cited above: all three of these aptitudes appear to have some importance in terms of job analysis data; all three aptitudes show significant correlations with the criterion; Aptitudes G and N have relatively high mean scores. Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes G, N and M with appropriate cutting scores. It was found that the addition of Aptitude N tended to lower the selective efficiency of norms which included Aptitudes G and M. Therefore Aptitude N was not included in the test norms.

Although there is some statistical evidence of significance for Aptitudes V and Q which warranted some preliminary consideration of these aptitudes for inclusion in the test norms, neither of these aptitudes appeared to be sufficiently important on the basis of both job analysis data and statistical data to warrant further consideration. Therefore neither of these aptitudes was included in the final test norms.

The cutting scores for Aptitudes G and M were set at one standard deviation unit below the means and rounded to the nearest five point score levels. The resulting norms consist of G-90 and M-80.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized with those workers rated as above average or average placed in the high criterion group, and with those rated as below average placed in the low criterion group. This resulted in 17 of the 59 men, or 29 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes G and M with critical scores of 90 and 80, respectively and the criterion for Artificial-Breeding Technician II . Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes G and M with Critical Scores of 90 and 80, Respectively and the Criterion for Artificial-Breeding Technician II 467.364

N = 59

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	36	42
Poor Workers	10	7	17
Total	16	43	59

$r_{tet} = .70$ $\quad x^2 = 9.997$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .005$

The data in the above table indicate a high and significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes G and M with minimum scores of 90 and 80, respectively, are recommended as B-1002 norms for the occupation of Artificial-Breeding Technician II. The equivalent B-1001 norms consist of G-95 and M-80.